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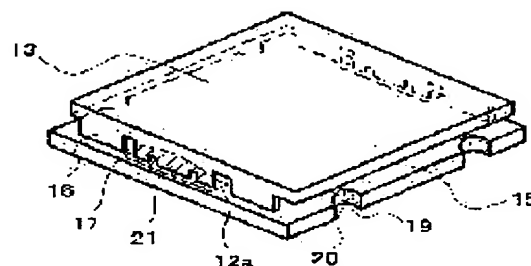
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(54) SURFACE-MOUNTING CRYSTAL OSCILLATOR

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a surface-mounting crystal oscillator that is flat and has a small volume by thinning the thickness of an insulating substrate as compared with the conventional one.

SOLUTION: The crystal oscillator comprises the flat insulating substrate 15, a packaging electrode formed on the lower surface, a conductive pattern 12d of an oscillation circuit formed on the upper surface of the insulating substrate 15, electronic components for composing a crystal oscillation circuit that is packaged on a conductive pattern 12a, and a metal lid 13 that covers the electronic components with the insulating substrate 15 for joining the lower end to conductive pattern 12a electromechanically. The lid 13 is obtained by performing the press forming of a thin metal plate in a box shape whose bottom surface is open, has a pair of extended sections 16 that oppose each other from the lower end, and joints the lower end of the extended sections 16 to the conductive pattern 12a on the insulating substrate 15. By joining the lid 13 onto the upper surface of the insulating substrate 15, the thickness of the insulating substrate 15 can be extremely thinned as compared with before.



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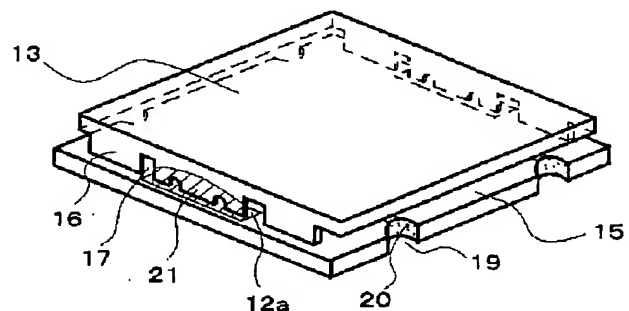
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(54)【発明の名称】 表面実装型的水晶発振器

(57)【要約】 (修正有)

【課題】絶縁基板の厚さを従来に比して薄くして、高さの低く体積の小さい表面実装型的水晶発振器を提供する。

【解決手段】板状の絶縁基板15と、その下面に形成した実装電極と、絶縁基板15の上面に形成した発振回路の導電パターン12dと、導電パターン12aに実装され水晶発振回路を構成する電子部品と、電子部品の上から絶縁基板15にかぶせて下端部を導電パターン12aに電気的機械的に接合した金属製の蓋体13とを具備する。蓋体13は薄い金属板を底面の開放した箱形にプレス成形したものであり、下端部より対面して一对の延出部16を有し、延出部16の下端を絶縁基板15上の導電パターン12aに接合する。このように絶縁基板15の上面に蓋体13を接合することにより、絶縁基板15の厚みを従来に比して著しく薄くすることができる。



【特許請求の範囲】**【請求項 1】** 絶縁基板と、

上記絶縁基板の下面に形成した実装電極と、
上記絶縁基板の上面に形成した発振回路の導電パターンと、

上記導電パターンに実装され水晶発振回路を構成する電子部品と、

上記電子部品の上から上記絶縁基板の上面にかぶせて下端部を上記導電パターンに機械、電氣的に接合した金属製の蓋体と、を具備することを特徴とする表面実装型の水晶発振器。

【発明の詳細な説明】**【0001】**

【発明の属する技術分野】 本発明は水晶発振器において、特に高さを低くして体積を小さくした表面実装型の水晶発振器に関する。

【0002】

【従来の技術】 最近では携帯電話など移動体通信機の小型・軽量化に対応して種々の表面実装型の電子部品が開発されている。表面実装型の電子部品は、これまでのようにリード端子を基板に穿設した孔に挿入するタイプと異なり、基板の上に載せて実装するため、小型・薄型化が進む利点がある。水晶発振器もまた、薄型でリードレス化した表面実装型が望まれている。

【0003】 図 4 及び図 5 は従来の表面実装型の水晶発振器を説明する図である。なお図 4 は表面実装型の水晶発振器の組立斜視図、図 5 は完成した状態の斜視図である。表面実装型の水晶発振器は、回路素子、水晶振動子等の電子部品 3 を実装した絶縁基板 1 に、金属性の蓋体 2 を被せて接合している。

【0004】 絶縁基板 1 は板状で、たとえばガラスエポキシ樹脂やセラミック等の絶縁材よりなり、上面に発振回路の導電パターン（図示せず）を形成し、下面には実装電極（図示せず）を形成している。また、側面に複数の切欠 5 を設け、各切欠の壁面に銅等の導電材を、いわゆるメッキ処理によって付着させて接続電極 6 を形成している。上記絶縁基板 1 の上面の導電パターンの所定部位と下面の実装電極は、接続電極 6 を介して電氣的に接続している。

【0005】 蓋体 2 は薄い金属板を底面の開放した箱形にプレス成形しており、各下端縁より下方向に比較的短い延出部 7、比較的長い第 1 の接合部 8、および比較的長い第 2 の接合部 8 a を形成している。蓋体 2 を絶縁基板 1 の上から被せると、蓋体 2 の延出部 7 の先端は絶縁基板 1 の上面で衝止し、第 1 の接合部 8 は絶縁基板 1 の側面の対応する切欠 5 と接合して、切欠内の接続電極 6 と電氣的に導通する。

【0006】 また第 2 の接合部 8 a は先端側を内方へ膨出加工して膨出部 9 を形成している。膨出部 9 は絶縁基板 1 の対応する切欠 5 a の凹部 10 に弾性的に嵌め合

せ、この部分に側面より適量の半田 11 を施して半田付けを行う。また、半田付けの接合効果を高めるため、第 2 の接合部 8 a には延出方向の両端側に貫通孔 4 を穿設し、半田付けの際に半田を充填するようにしている。

【0007】 しかし、絶縁基板 1 の側面で蓋体 2 を弾性的に嵌め合わせるためには、絶縁基板 1 にある程度（従来は 0.8 mm 程）の厚みが必要であり、前述の薄型化に対応するために絶縁基板の厚さを従来よりも薄くした場合、絶縁基板 1 の側面で蓋体 2 を嵌め合わせ、半田付けをする作業は著しく困難になり、所望の機械的強度も得られない問題があった。

【0008】

【発明が解決しようとする課題】 本発明は以上の点に鑑みてなされたもので、蓋体を絶縁基板の側面で接合するがゆえに絶縁基板の厚みが必要となるのであれば、絶縁基板と蓋体の接合を絶縁基板の上面で行うことで、絶縁基板の厚さを薄し、高さが低く体積の小さい表面実装型の水晶発振器を提供することを目的とする。

【0009】

【課題を解決するための手段】 本発明は、板状の絶縁基板と、上記絶縁基板の下面に形成した実装電極と、上記絶縁基板の上面に形成した発振回路の導電パターンと、上記導電パターンに実装され水晶発振回路を構成する電子部品と、上記電子部品の上から上記絶縁基板にかぶせて下端部を上記導電パターンに電氣的機械的に接合した金属製の蓋体と、を具備することを特徴とする。

【0010】

【発明の実施の形態】 以下、本発明の実施の形態を図 1 ないし図 3 を参照して詳細に説明する。図 1 は本発明による表面実装型の水晶発振器の斜視図、図 2 は同絶縁基板図であり、図（a）は上面図、図（b）は下面図である。また図 3 は同要部拡大図である。表面実装型の水晶発振器は、板状の絶縁基板 15 と、実装電極 14 と、導電パターン 12 と、図示しない電子部品と、蓋体 13 を備える。

【0011】 絶縁基板 15 は、前述同様セラミック等の絶縁材よりなる板体であり、上面に発振回路用の導電パターン 12 を形成している。導電パターン 12 と、絶縁基板 15 の下面に形成した実装電極 14 は、前述同様、絶縁基板 15 の側面に設けた複数の切欠 19 の壁面に形成した接続電極 20 を介して電氣的に接続している。また、導電パターン 12 に実装された図示しない回路素子や水晶振動子などの電子部品によって水晶発振回路を構成している。

【0012】 蓋体 13 は従来例と同様に薄い金属板を底面の開放した箱形にプレス成形してあり、下端縁より対面して一对の延出部 16 を、同方向に同じ長さで延出している。蓋体 13 を絶縁基板 15 に載置し、延出部 16 の下端を絶縁基板 15 の上面に形成した導電パターン 12 a に接合する。この接合部分に半田 21 を施し半田付

けを行うことにより、蓋体 13 と導電パターン 12a は電気的、機械的に接合する。

【0013】また、延出部 16 の 2 カ所に溝 17 を切り込んでおくことにより、半田付けの際に、溝 17 に挟まれた中央部分だけに半田 21 を施すことができ、半田の無駄な広がり防止できる。さらに、適量の半田で接合効果を高めるために、溝 17 に挟まれた中央部分にも補助溝 18 を形成している。

【0014】このように絶縁基板 15 の上面に蓋体 13 を接合するため、従来、絶縁基板の側面で蓋体を嵌め合わせるために必要であった絶縁基板 15 の厚さを、必要な機械的強度を得ることのできる範囲で著しく薄くすることが可能になる。しかも従来のように絶縁基板 15 の側面に対して作業を必要とする場合に比べ、上記実施例では絶縁基板 15 の上面で作業を行うため、半田付けの作業工程の歩留まりは格段に向上する。

【0015】また、従来は絶縁基板 15 の側面に接合するようにしているので、蓋体と切欠の壁面に形成した接続電極を半田付けしているため、切欠の壁面に付着した銅箔の接着強度に頼ることになり、低い強度しか得られない。たとえば取り扱い上の不注意で蓋体を上から押圧する力が作用したような場合、側面の半田部分に過大な力が加わり、銅箔がはがれて蓋体が脱落する事故となる。

【0016】これに対して、絶縁基板 15 の上面に電気的機械的に形成された導電パターン 12a に直接蓋体 13 を堅固に接合することにより、前述のような事故を防止することができ、接合部の信頼度が向上する。

【0017】このほかに、金属製の蓋体 13 と接合する導電パターン 12a を、たとえば絶縁基板 15 の裏面に形成したアース電極 22 と接続する接続電極 20a に引き出せば、ケース全体の大部分をアース電位にでき、い

わゆるケースアースとなり、電磁波対策のうえからも好ましい。

【0018】また、上記説明で絶縁基板と蓋体の接合部分に適量の半田を施し半田付けをするとしたが、導電性接着剤等を使用しても同様の効果が得られることは勿論である。

【0019】

【発明の効果】以上詳述したように、本発明によれば、電子機器の小型・薄型化の要望に応える高さが低く体積の小さい表面実装型の水晶振動子を提供することができる。しかも適量の半田で容易かつ確実な作業ができるため、製品の均一性が向上し、信頼性を高めるのに役立つ。

【図面の簡単な説明】

【図 1】本発明の実施の形態を説明する表面実装型の水晶発振器の斜視図である。

【図 2】本発明の実施の形態を説明する表面実装型の水晶発振器の絶縁基板図であり、図 (a) は上面図、図 (b) は下面図である。

【図 3】本発明の実施の形態を説明する表面実装型の水晶発振器の要部拡大図である。

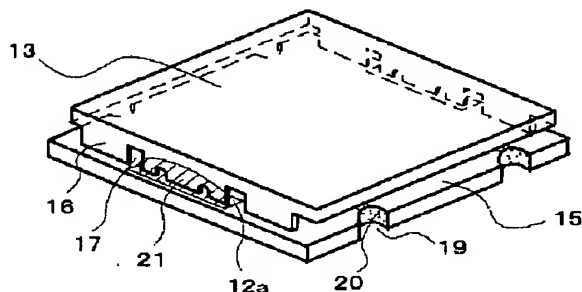
【図 4】従来の表面実装型の水晶発振器の組立斜視図である。

【図 5】従来の表面実装型の水晶発振器の完成した状態の斜視図である。

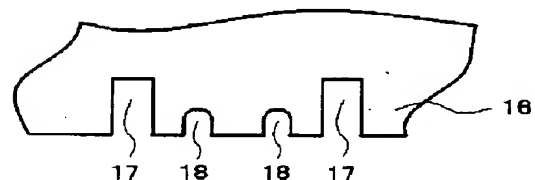
【符号の説明】

1、15 絶縁基板、2、13 蓋体、3 電子部品、4 貫通孔、5、19 切欠、6、20 接続電極、7、16 延出部、8 接合部、9 膨出部、10 凹部、11、21 半田、12 導電パターン、14 実装電極、17 溝、18 補助溝、22 アース電極、

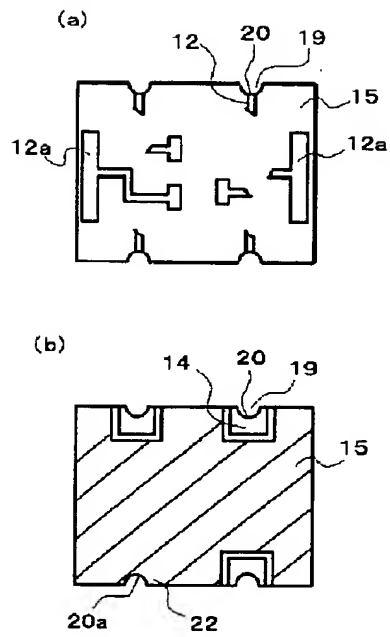
【図 1】



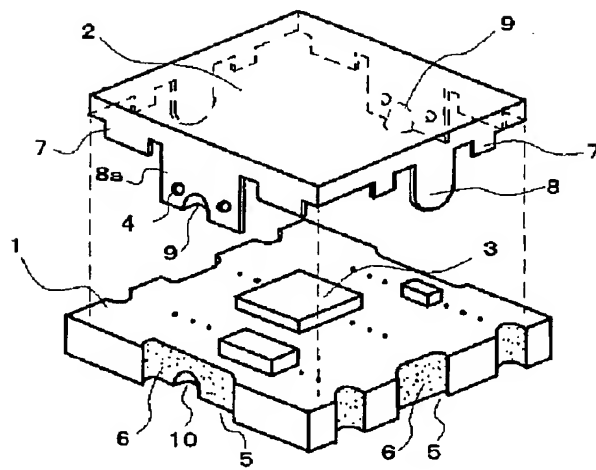
【図 3】



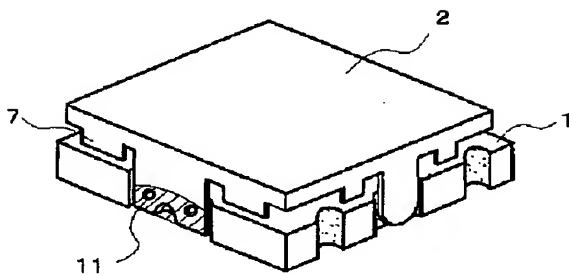
【図2】



【図4】



【図5】



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CLAIMS

[Claim(s)]

[Claim 1] The crystal oscillator of the surface mount mold characterized by to cover the top face of the above-mentioned insulating substrate from on an insulating substrate, the mounting electrode formed in the inferior surface of tongue of the above-mentioned insulating substrate, the electric-conduction pattern of the oscillator circuit formed in the top face of the above-mentioned insulating substrate, the electronic parts which are mounted in the above-mentioned electric-conduction pattern, and constitute a ridge oscillator, and the above-mentioned electronic parts, and to provide a machine and the metal lid joined electrically to the above-mentioned electric-conduction pattern for the lower-limit section.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to the crystal oscillator of the surface mount mold which made height low and made the volume small in a crystal oscillator.

[0002]

[Description of the Prior Art] Recently, corresponding to small and lightweight-izing of mobile transmitters, such as a cellular phone, the electronic parts of various surface mount molds are developed. Since the electronic parts of a surface mount mold carry and mount a lead terminal on a substrate like the former unlike the type inserted in the hole drilled in the substrate, they have the advantage to which small and thin shape-ization progress. A surface mount mold which also formed the crystal oscillator into the Lee dress with the thin shape is desired.

[0003] Drawing 4 and drawing 5 are drawings explaining the crystal oscillator of the conventional surface mount mold. In addition, drawing 4 is the assembly perspective view of the crystal oscillator of a surface mount mold, and a perspective view in the condition that drawing 5 was completed. The crystal oscillator of a surface mount mold put the metallic lid 2 on the insulating substrate 1 which mounted the electronic parts 3, such as a circuit element and a quartz resonator, and is joined to it.

[0004] An insulating substrate 1 is tabular, for example, consists of insulating materials, such as a glass epoxy resin and a ceramic, forms the electric conduction pattern (not shown) of an oscillator circuit in a top face, and forms the mounting electrode (not shown) in an inferior surface of tongue. Moreover, form two or more notching 5 in a side face, electric conduction material, such as copper, is made to adhere to the wall surface of each notching by the so-called plating processing, and the connection electrode 6 is formed. The mounting electrode of the predetermined part of the electric conduction pattern of the top face of the above-mentioned insulating substrate 1 and an inferior surface of tongue is electrically connected through the connection electrode 6.

[0005] The lid 2 is carrying out press forming of the thin metal plate to the cube type which the base opened, and forms the extension section 7 downward comparatively shorter than each lower limit edge, the 1st comparatively long joint 8, and comparatively long joint 8 of ** 2nd a. If a lid 2 is put from an insulating substrate 1, the tip of the extension section 7 of a lid 2 is fixed on the top face of an insulating substrate 1, and the 1st joint 8 will join to the notching 5 to which the side face of an insulating substrate 1 corresponds, and it will flow through it electrically with the connection electrode 6 in notching.

[0006] Moreover, 2nd joint 8a carries out bulge processing of the tip side to the inner direction, and forms the bulge section 9. The bulge section 9 is elastically inserted in the crevice 10 of notching 5a where an insulating substrate 1 corresponds, and solders to this part by giving the solder 11 of optimum dose from a side face. Moreover, in order to heighten the junction effectiveness of soldering, he drills a through tube 4 in the 2nd joint 8a at the both-ends side of the extension direction, and is trying to be filled up with solder in the case of soldering.

[0007] However, in order to insert in a lid 2 elastically on the side face of an insulating substrate 1, a certain amount of (it is about 0.8mm conventionally) thickness was required for the

insulating substrate 1, and since it corresponded to the above-mentioned thin shape-ization, when thickness of an insulating substrate was made thinner than before, the lid 2 was inserted in on the side face of an insulating substrate 1, and the activity which solders became remarkably difficult and had the problem from which a desired mechanical strength is not obtained, either.
[0008]

[Problem(s) to be Solved by the Invention] This invention was made in view of the above point, is performing junction of an insulating substrate and a lid on the top face of an insulating substrate, if the thickness of an insulating substrate is needed although a lid's is joined on the side face of an insulating substrate therefore, and ** thickness of an insulating substrate, and height aims at offering the crystal oscillator of a low surface mount mold with the small volume.
[0009]

[Means for Solving the Problem] This invention is characterized by to provide the mounting electrode formed in the tabular insulating substrate and the inferior surface of tongue of the above-mentioned insulating substrate, the electric-conduction pattern of the oscillator circuit formed in the top face of the above-mentioned insulating substrate, the electronic parts which are mounted in the above-mentioned electric conduction pattern, and constitute a ridge oscillator, and the metal lid which covered the above-mentioned insulating substrate from on the above-mentioned electronic parts, and joined the lower limit section to the above-mentioned electric conduction pattern electrically mechanically.
[0010]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail with reference to drawing 1 thru/or drawing 3. The perspective view of the crystal oscillator of the surface mount mold according [drawing 1] to this invention and drawing 2 are these insulating-substrate Figs., drawing (a) is a plan and drawing (b) is a bottom view. Moreover, drawing 3 is this important section enlarged drawing. The crystal oscillator of a surface mount mold is equipped with the tabular insulating substrate 15, the mounting electrode 14, the electric conduction pattern 12, the electronic parts that are not illustrated, and a lid 13.

[0011] An insulating substrate 15 is a board it becomes same from insulating materials, such as a ceramic, mentioning above, and forms the electric conduction pattern 12 for oscillator circuits in a top face. The electric conduction pattern 12 and the mounting electrode 14 formed in the inferior surface of tongue of an insulating substrate 15 are electrically connected through the connection electrode 20 formed in the wall surface of two or more notching 19 prepared in the side face of an insulating substrate 15 like the above-mentioned. Moreover, electronic parts which were mounted in the electric conduction pattern 12 and which are not illustrated, such as a circuit element and a quartz resonator, constitute the ridge oscillator.

[0012] Press forming of the lid 13 has been carried out to the cube type with which the base opened the thin metal plate like the conventional example, and it met from the lower limit edge and has extended the extension section 16 of a pair by the same die length as this direction. A lid 13 is laid in an insulating substrate 15, and it joins to electric conduction pattern 12a in which the lower limit of the extension section 16 was formed on the top face of an insulating substrate 15. By soldering to a part for this joint by giving solder 21, a lid 13 and electric conduction pattern 12a are joined electrically and mechanically.

[0013] Moreover, by cutting the slot 17 deeply to two places of the extension section 16, in the case of soldering, solder 21 can be given only to the central part pinched by the slot 17, and the useless breadth of solder can be prevented. Furthermore, in order for the solder of optimum dose to raise the junction effectiveness, the supplemental groove 18 is formed also in the central part pinched by the slot 17.

[0014] Thus, in order to join a lid 13 to the top face of an insulating substrate 15, it becomes possible to make remarkably thin thickness of the insulating substrate 15 which was required in order to insert in a lid on the side face of an insulating substrate conventionally in the range which can obtain a required mechanical strength, and in order to work in the above-mentioned example on the top face of an insulating substrate 15 compared with the case where an activity is needed to the side face of an insulating substrate 15 like before, the yield of the routing of soldering is boiled markedly and improves.

[0015] Moreover, conventionally, since he is trying to join to the side face of an insulating substrate 15 and the lid and the connection electrode formed in the wall surface of notching are soldered, it will depend on the bond strength of the copper foil adhering to the wall surface of notching, and only low reinforcement is obtained. For example, when the force which presses a lid from a top by the inattention on handling acts, the excessive force joins the solder part of a side face, and accident from which copper foil peels and a lid is omitted is caused.

[0016] On the other hand, by joining the direct lid 13 to electric conduction pattern 12a formed in the top face of an insulating substrate 15 electrically mechanically strongly, the above accident can be prevented and the reliability of a joint improves.

[0017] In addition, if electric conduction pattern 12a joined to the metal lid 13 is pulled out to connection electrode 20a linked to the ground electrode 22 formed in the rear face of an insulating substrate 15, the greater part of whole case is made into ground potential, and it becomes the so-called case ground, and is desirable also from the top of the cure against an electromagnetic wave.

[0018] Moreover, although soldered to a part for the joint of an insulating substrate and a lid by giving the solder of optimum dose by the above-mentioned explanation, even if it uses electroconductive glue etc., of course, the same effectiveness is acquired.

[0019]

[Effect of the Invention] As explained in full detail above, according to this invention, the height which meets the request of small and thin-shape-izing of electronic equipment can offer the quartz resonator of a low surface mount mold with the small volume. And since an easy and positive activity can be performed with the solder of optimum dose, the homogeneity of a product improves and it is useful to raising dependability.

[Translation done.]

* NOTICES *

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view explaining the gestalt of operation of this invention of the crystal oscillator of a surface mount mold.

[Drawing 2] It is the insulating-substrate Fig. of the crystal oscillator of the surface mount mold explaining the gestalt of operation of this invention, and drawing (a) is a plan and drawing (b) is a bottom view.

[Drawing 3] It is the important section enlarged drawing of the crystal oscillator of the surface mount mold explaining the gestalt of operation of this invention.

[Drawing 4] It is the assembly perspective view of the crystal oscillator of the conventional surface mount mold.

[Drawing 5] It is a perspective view in the condition that the crystal oscillator of the conventional surface mount mold was completed.

[Description of Notations]

1, 15 ground electrode, 2 An insulating substrate, 13 A lid, 3 Electronic parts, 4 6 A through tube, 5, 19 notching, 20 7 A connection electrode, 16 The extension section, 8 A joint, 9 The bulge section, 10 11 A crevice, 21 Solder, 12 An electric conduction pattern, 14 A mounting electrode, 17 A slot, 18 The supplemental groove, 22

[Translation done.]

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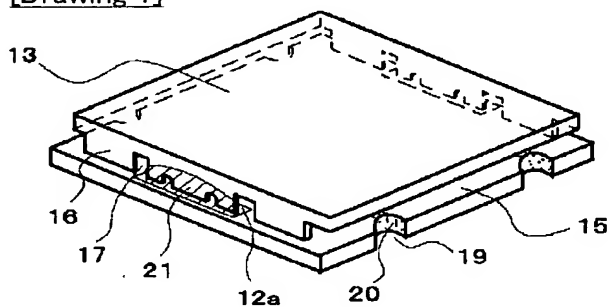
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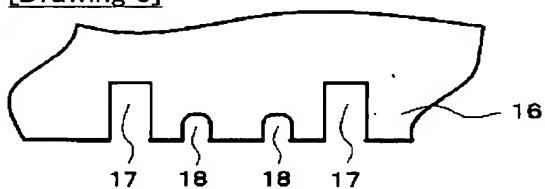
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DRAWINGS

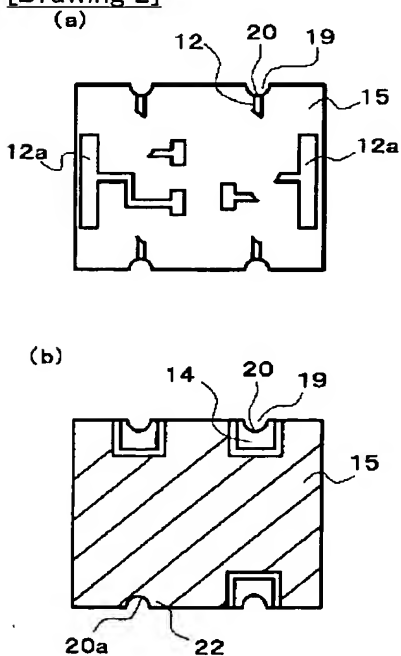
[Drawing 1]



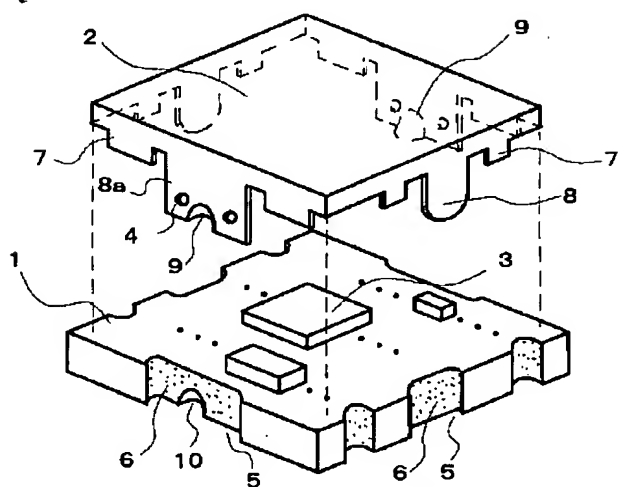
[Drawing 3]



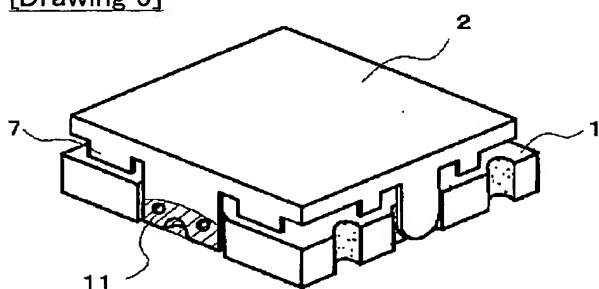
[Drawing 2]



[Drawing 4]



[Drawing 5]



[Translation done.]